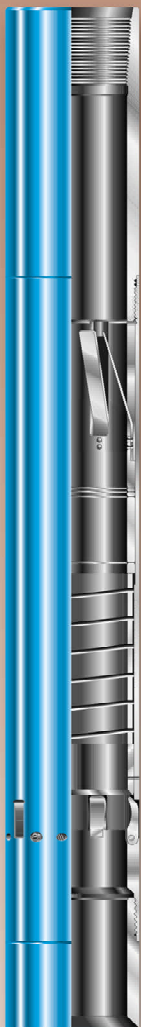


EXTERNAL CUTTERS

Instruction Manual 5500



External Cutters

One Company Unlimited Solutions

NOV NATIONAL OILWELL VARCO

External Cutters

INDEX

External Cutters	
General Description	3
Use	3
Construction	3
Operation	5
Washover	5
Running the Cutter	5
Making the Cut	5
Running-In Precautions	5
Cutting Precautions	9
Proving the Cut	9
Maintenance	10
Disassembly	10
Reassembly	11
Specifications and Replacement Parts	12 – 13
Strength Data	14

The designs and specifications for the tools described in this instruction manual were in effect at the time this manual was approved for printing. National Oilwell Varco, whose policy is one of continuous improvement, reserves the right to discontinue models at any time, or to change designs and specifications without notice or without incurring obligation.

Seventeenth Printing, September 2005

General Description

The Bowen External Cutter is an automatic spring-fed pipe cutter that provides fast, efficient external cutting and recovery of long sections of pipe. Due to its automatic spring-fed feature it eliminates the inadvertent application of excessive strain being applied from the rig floor, preventing the knives from becoming burned or broken before the cut is made.

Use

The Bowen External Cutter is used to cut and to remove stuck pipe in long undamaged sections. It is used in conjunction with a washover string to make a well placed cut to remove the stuck pipe. Bowen External Cutters are capable of cutting all types of struck drill pipe or tubing or casing. Interchangeable Spring Dog, Ratchet Pawl, or Slip Assemblies adapt the Bowen External Cutter to any type of drill pipe or tubing to be cut.

Construction

The Bowen External Cutter consists of a Top Sub, Body, Guide, Knives, Spring Dog Assembly Thrust Washer, Thrust Bearing, Preload Sleeve, Feed Ring, Main Spring, and Shear Pins.

The Top Sub is threaded into the Body. It has a suitable running string connection at its upper end. The inner parts of the External Cutter are maintained in position by the Top Sub.

The Body has Knife slots in the lower end, threaded connections top and bottom to accept the Top Sub and Guide, and a shoulder in the inside diameter which acts as a stop for the Thrust Washer and the parts above the Thrust Washer to stop against, during operation. The Knife slots incorporate cross-holes for the Knife Pins. Two drilled holes are arranged diametrically opposite each other in the Body, for the Shear Pins.

The Guide is threaded into the bottom of the Body. Its purpose is to guide the fish into the Cutter. The Guide is usually cut-lipped. An alternate guide, such as an extra long wall hook, or mill toothed guide may be substituted if required.

The Knives are made from tool steel, shaped at the cutting end for most efficient cutting action, and tempered for strength and toughness. The shank end is radius formed to match the concave bearing face against which it rests in the Cutter Body. (These Bearing Blocks are an integral part of the Body). The shank end of each Knife has a hole to accept the Knife Pin. Set screws maintain the Knife Pins in the Body.

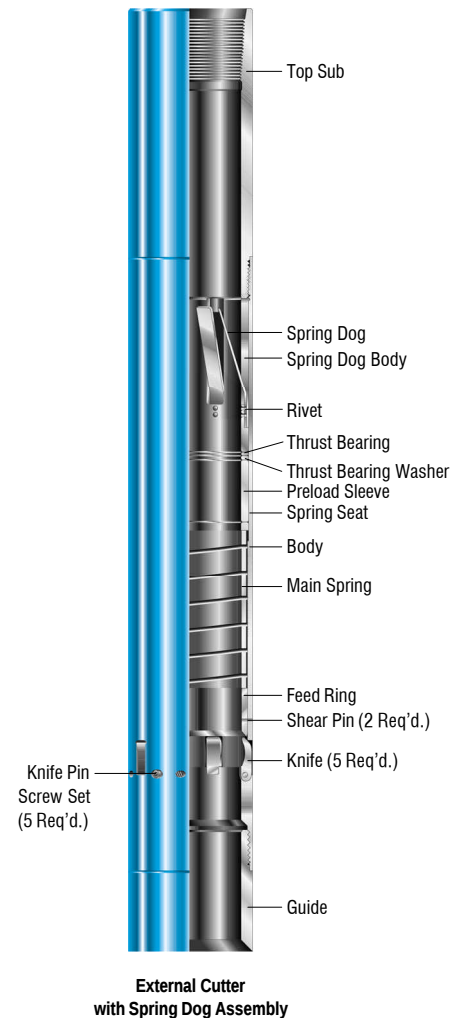
The Spring Dog Assembly is the standard collar catcher assembly, and will be furnished with the Cutter unless another type is requested as optional.

The Spring Dog is used if the pipe or tubing has squared shoulder tool joints, couplings or collars.

The Dog Springs are designed to catch under the coupling to actuate the Cutter and to retain the cut-off section of the pipe or tubing.

The Spring Dog Assembly consists of a cylinder, six rectangular vertically mounted springs, and twelve rivets. The Springs are so arranged as to rest at their lower end on a shoulder, so that force applied to the Springs will be transmitted to the Spring Dog Body rather than the rivets.

The Springs are closed in at the top in a regular pattern to form a small opening. This arrangement allows the Spring Dog assembly to effectively pass collars or couplings by deflecting outwardly, but close in around the pipe or tubing so that they will always be in position to butt up against the bottom of the collar or



coupling when raised. The Springs are closed in sufficiently to effectively catch any size pipe or tubing which the Cutter is designed to cut.

When the optional Ratchet Pawl Assembly is used, a Single Pawl Spacer is used with it. The purpose of the Single Pawl Spacer is to add extra length to the Ratchet Pawl Assembly sufficient to make their combined length the same as a standard Spring Dog Assembly. The length of a Ratchet Pawl Assembly is half the length of the Spring Dog Assembly, so that if two Ratchet Pawl Assemblies are run in tandem, no Single Pawl Spacer need be used, and is omitted.

When the optional Slip Assembly is used, an Adaptor is used. This Adaptor is located between the cutter Top Sub and Body. It forms an extra length housing for the Slip Assembly. The upper end of the Adaptor screws onto the Top Sub, and the lower end into the Cutter Body. An internal shoulder is situated just below the thread at the upper end, against which the slip Spring pushes. The shoulder formed by the lower pin end of the Adaptor maintains the Slip Retainer Bowl in position, when assembled for service.

The Thrust Washer and Thrust Bearing are situated between the Main Spring and Spring Dog assembly (or Ratchet Pawl or Slip assembly). Their purpose is to allow the entire Cutter assembly except the Spring Dog Assembly to rotate during operation, while the Spring Dog assembly remains rotationally motionless.

The Preload Sleeve is a steel cylinder in form. It is located between the Thrust Washer and the top of the Main Spring. The purpose of the Preload Sleeve is to maintain sufficient preload on the Feed Ring to effect a cut at any point on the fish, without the necessity of applying a pull load from the surface. If the operator prefers, the Preload Sleeve may be removed. When it is removed, it relieves all preload on the Main Spring, so that the knives must be manually fed from the surface.

The Preload Sleeve is used with all three catcher assemblies; Spring Dog, Ratchet Pawl and Slip Assembly. The only time it is not used is when it is desired to manually feed the Knives.

The Feed Ring is a cylinder in form. It has two Shear Pin holes situated diametrically opposite. Its lower face is bevelled to nest below the knife cutting ends.

In operation, the Feed Ring forces the Knives inward against the fish in the most efficient manner to effect the cut. The Shear Pins maintain the Feed Ring in running-in position until the force exerted against them by the pull from the rig floor shears the Pins, releasing the Feed Ring.

The Main Spring is a large spring wound from rectangular cross-section spring steel. It is tempered to give long trouble free service. In operation it is preloaded by a predetermined amount calculated to exert the best cutting load to each knife, which is transmitted through the Feed Ring. The Main Spring is situated between the Thrust Washer (or Spring Seat), and Feed Ring. Once the Shear Pins have been sheared, no load need be applied to the Cutter from the rig floor to effect a cut. The Cutter may be moved down to any point between the two collars or joints where shearing was effected for the actual cut. This is made possible by the calculated preload on the Main Spring.

The Shear Pin is manufactured from clean shearing brass rod. The size of the Shear Pin varies with the size of the cutter. The shear strength of each Shear Pin is listed in the Specification Table on pages 11 and 12.

The Ratchet Pawl Assembly is designed to catch tapered upset integral tool joints

The Ratchet Pawl Assembly is a thick walled cylinder which contains a number of Pawls (5 to 8) depending on size). These Pawls are arranged so that they form a circle around the pipe. They are spring loaded to allow them to be deflected by passing a coupling or collar, then return to their horizontal position after passing the coupling. In operation, they catch against the underside of the taper, transmitting the load from the Pawls, through the Pawl Body, and to the Main Spring.

The Ratchet Pawl Assembly will effectively catch only one size pipe or tubing joint as a general rule, and a separate Ratchet Pawl assembly must be used for each size, or the Ratchet Pawl assembly may be redressed with Pawls of the proper length for each size with which it is used.

An advantage of the Ratchet Pawl Assembly is that by repeatedly jarring it up against the collar, or taper, the operator may succeed in shearing the Pawl Pins, thus effecting release of the Cutter, in the event that it is desired not to cut the pipe once cutting position is reached. This allows the cutter to be brought out of the hole without the necessity of making a cut.

The Slip Assembly is used where the pipe or tubing has semi-flush or external flush tool joints. The Slips grip the pipe or tubing at any random point to actuate the Cutter and to retain the cut-off section of pipe or tubing.

The Slip Assembly consists of a Slip Bowl, Slips, Slip Spring, Slip Bowl Retainer, Slip Bowl Shear Pins, and Slip Adaptor.

Shear Pins provide a method of releasing from the fish downhole if necessary. The shear strength of each Slip Bowl Shear Pin is listed in the Specification Tables on pages 11 and 12.

Operation Wash Over

Before running the Bowen External Cutter, a washover operation is first necessary to free the stuck pipe from the formations. The washpipe is equipped with a washover shoe having an outside diameter slightly larger and an inside diameter slightly smaller than the Bowen External Cutter to be used. (A Bowen Rotary Washover Shoe is recommended.) This is to establish adequate clearance so that the Bowen External Cutter may be lowered over the stuck pipe. It is recommended further that the stuck pipe be washed over for at least one full joint below where the cut is to be made so that the stuck pipe will be centralized in the hole at the point of the cut.

After washing-over the stuck pipe for the desired distance, the washover string is withdrawn from the well and the washover shoe is removed from the bottom of the string and the Bowen External Cutter is installed in its place.

Running the Cutter

Make certain that the Bowen External Cutter has been properly assembled with the appropriate Assembly (Spring Dog, Ratchet Pawl or Slip Assembly as dictated by the tool joints or couplings of the stuck pipe). Also check the Bowen External Cutter to ascertain that it is the proper size for the pipe to be cut; refer to the Specification Table for dimensions and part numbers.

Make up the Bowen External Cutter to the bottom of the washover string and tighten all connections with the tongs. Avoid placing tongs directly over the Knife Slots. At this time, it is recommended that the Knives be wedged into the Knife Slots to prevent their falling toward the inside of the cutter and being damaged while moving down hole.

This is accomplished by passing a strand of string or cord around the Knife and pulling it toward the outside of the Body. The string binds the Knife in the slot.

The cutting string is lowered into the well and the Guide lip on the Bowen External Cutter contacts and passes over the top of the fish. The tool is lowered to the depth previously washed free.

The amount of pipe passed over should not exceed the weight shown in the chart on page 14.

Making the Cut

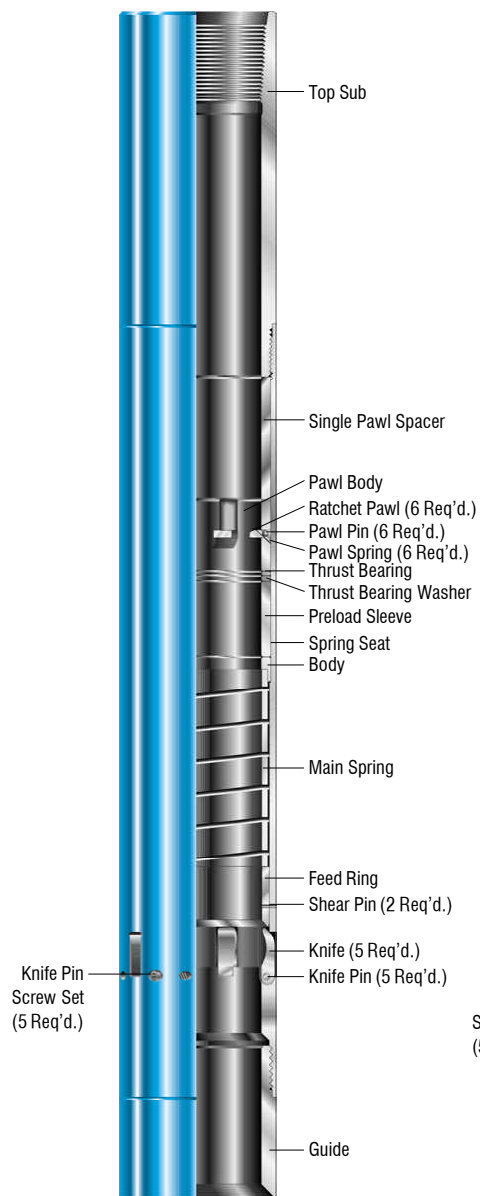
When the desired depth is reached, the cutting string is raised until the Spring Dog Assembly (or Ratchet Pawl Assembly) engages the tool joint. A strain is taken which compresses the Main Spring and shears the Feed Ring Shear Pin. The shearing of the pins is clearly apparent by a quick movement of the weight indicator.

After shearing the pins, the cut may be made at any point on the tubing. The spring will provide the force to feed the knives into the pipe at a predetermined rate. It is not necessary to maintain an upstrain against the collar or upset unless the preload sleeve has been removed. It should be noted, however, that maintaining an upstrain will help provide an indication when the cut is complete.

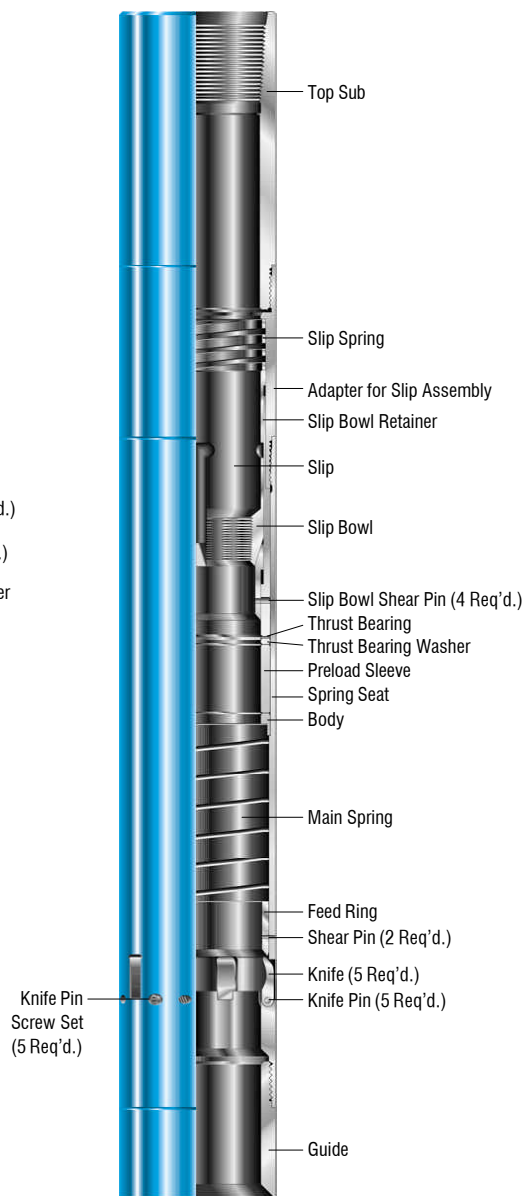
The cut is made by rotating the cutting string to the right at a uniform rate of speed. When the pipe is severed, there will be a noticeable movement of the weight indicator. The cut-off section is withdrawn from the well, and the above procedure is repeated until all of the stuck pipe is removed.

Running-In Precautions

1. Upon reaching the top of the fish, it is advisable to circulate to condition the mud and to flush all mud cake or debris from the tool.
2. Care should be exercised when going over the top of the fish and whenever possible the Bowen External Cutter should be rotated to the right while going over. After the fish has entered the cutter, the cutter must not be raised more than absolutely necessary. When pulling the

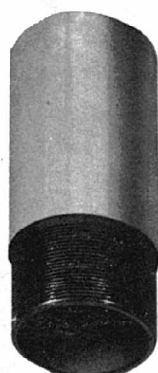


**External Cutter
with Ratchet Pawl Assembly**



**External Cutter
with Slip Assembly**

Cutters Exploded View



Top Sub



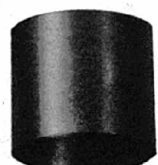
Spring Dog Assembly



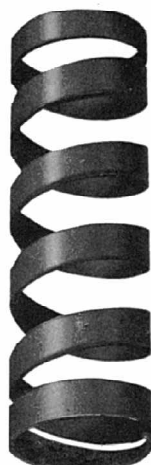
Thrust Bearing



Thrust Washer



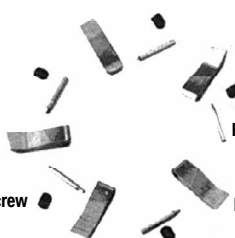
Preload Sleeve



Main Spring



Feed Ring



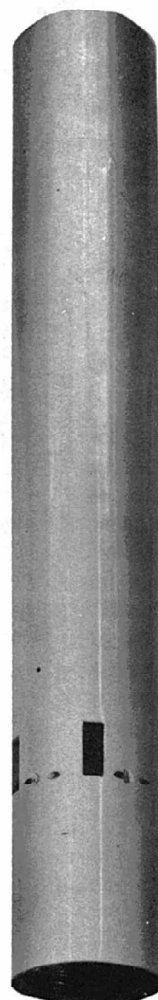
Set Screw

Knife Pin

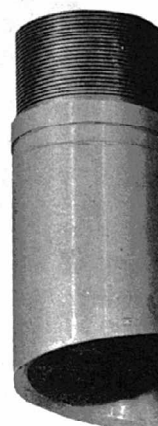
Knife



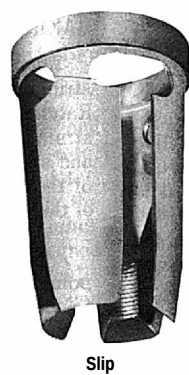
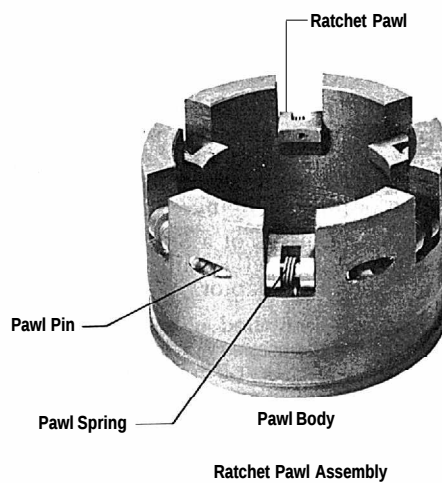
Shear Pin



Body



Guide



Slip Bowl Shear Pin

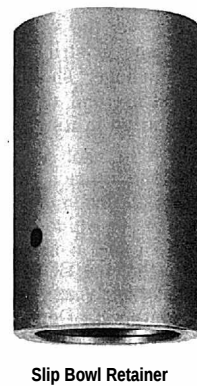
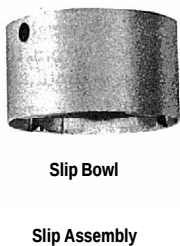


table slips on the rig the cutting string should be lifted only high enough to free the table slips. If one table slip segment is free and the others are tight, the table should be turned to free the tight ones. The cutting string must not be pulled higher than needed to release the table slips in order to insure that upward movement will not shear the shear pins and force the Knives into contact with the fish. If this should happen, it will be necessary to cut the fish at this point as the cutter will not pass over the next lower tool joint or coupling without breaking Knives.

Cutting Precautions

1. When selecting the proper place to make the cut, it is recommended that the cut be made one joint above the lowest position to which the rotary washover shoe was run. This will leave, below the cutter, one joint of free pipe which will spring away from the wall and align itself in the cutter.
2. After the kelly is made up in the string, and with circulation established at normal rate, the cutting string should be rotated to determine the amount of torque required to run the cutter, when the Knives are not in contact with the fish. After the hole has been washed sufficiently and the cutter is rotating freely, the circulation and rotation must be stopped and the cutting string raised until the Dog Springs contact the next higher tool joint or coupling. In cutters using the Slip Sub-assembly, the slips contact the pipe at all times. Raising the cutter will shear the brass pins between the Feed Ring and the Body above the Knives and force the Knives in against the fish.

3. Care should be exercised not to run the circulation pumps so that pulsations are transmitted to the cutting string, as this will cause the Knives to move up and down synchronous to the pulsations, resulting in an uneven cutting action.
4. When starting rotation, the operator is cautioned to apply only a small amount of torque. If free rotation is not established at this point, the cutter should be lowered slightly until the string can be turned with a minimum of torque. Allow the cutter to rotate freely for a few minutes. Then stop the rotation, pick up the cutting string about 1/4" and again try rotation. If raising 1/4" does not change the amount of torque required, the raising and rotating should be repeated until increased torque is in evidence. This will tell the operator that the Knives are cutting the pipe. From this time until the cut is complete, it is well to take every precaution against excessive torque.
5. Sometimes, when the coupling or tool joint, under which the Dog Springs are engaged, is quite thin, the Dog Springs may rotate off the coupling shoulder before the cut is complete.

Caution: If there is an indication that the Dog Springs have rotated off the coupling shoulder, stop rotation before continuing to prevent damage to the Knives.

If the pipe is not raised carefully, the Knives may catch beneath the collar or tool joint and break. Should the Dog Springs rotate off the shoulder, the pipe must be backed down until the Dog Springs are again engaged under the coupling or tool joint, and cutting operations resumed. Be careful not to exceed the maximum load ratings to prevent damage to the Knives.

Proving the Cut

Normally, when the pipe is severed by the Bowen External Cutter, there will be a noticeable movement on the weight indicator.

To prove a cut, the drill pipe string should first be raised 1" to 2" or until there is from two to three points additional load shown on the indicator, this being sufficient to lift the cut portion of the fish. The raising is done to avoid pinching the Knives between the portion of the fish that has been cut and the fish remaining in the hole. After raising, the string should be rotated. If the string rotates freely, it is almost conclusive proof that the cut has been successfully made. The pipe should again be raised carefully, and if no additional obstacles are encountered, all of the string may be hoisted and the fish removed from the hole.

There are several different changes in the action of the cutter that may indicate to the operator that a cut is completed, all of which will become more noticeable and familiar with experience. For example: if a short fish is being cut, the speed of rotation may increase and the cutter run free immediately after the cut is completed. If a long fish is being cut, the portion of the fish above the cutter may be heavy enough to pinch the Knives against the lower portion of the fish, just before the cut is completed, and make forward rotation impossible; or the cutter may continue to rotate smoothly, although the Knives are slightly pinched, but will require additional torque to rotate; or the weight indicator may suddenly, while rotating, rise slightly indicating the cut to be complete and the cutter carrying a portion of the weight of the severed piece. None of these indications should,

however, be taken as positive proof of a completed cut, and the drill pipe should not be withdrawn from the hole until the proof test as described above has been made.

Coming Out of the Hole

When the operator is convinced the cut has been completed, he may begin hoisting very slowly. This slow hoisting should continue for one or two joints to assure that the cut is actually made and to prevent striking a collar with excessive force. If the cut has not been made, there is usually no alternative to shearing the knife pins, spring dogs, or ratchet pawls in order to retrieve the cutter. The cutter must then be brought to the surface and completely redressed.

When the washpipe has reached the surface, the operator should be able to tell where the top of the fish will be in relation to the top of the washpipe. Therefore, he may lay down the required number of joints of washpipe to allow the fish to extend above the top of the washpipe. This will permit him to hoist the fish, with the aid of two elevators, from the washpipe while the same is being held in the table with the slips. When there is no coupling on the top of the fish, it is recommended that a Safety Clamp be placed around the fish and a drill pipe elevator used under the clamp to raise the top section of the fish.

After the fish has been laid down, the washpipe may be pulled from the hole and the cutter unscrewed from the bottom joint. At this time, the operator should supervise the breaking loose of the cutter. Tongs should be placed in the same manner as when making up. For ease of servicing the cutter, the threaded connection between the Top Sub and the Body should be loosened to hand-tight.

Maintenance

The Bowen External Cutter should be thoroughly washed and cleaned to remove all drilling mud and other debris. All parts, particularly the Knives, should be examined for wear and damage and replaced as necessary. It is recommended that the Bowen External Cutter be completely disassembled, cleaned, either lubricated or painted, and reassembled before storing.

Disassembly

1. At the rig, when the Bowen External Cutter is removed from the well, it should be thoroughly washed down with clean water to remove all excess drilling mud, etc. At this time it is advisable to break the Top Sub from the Body with the rig tongs to a point where it may be uncoupled by hand.
2. Remove the entire assembly to a place that is clean and convenient for disassembly.
3. Clamp the Cutter in a suitable vise, near the center of its length.
4. Loosen and remove the Top Sub.

CAUTION: The Top Sub will be under considerable tension load exerted by the Main Spring, so care must be exercised in its removal to avoid damage to the Top Sub, or injury to the operator.

5. Lift out the Spring Dog Assembly.
6. Remove the Thrust Bearing and Thrust Washer.
7. Remove the Preload Sleeve.
8. Remove the Main Spring.
9. Slide out and remove the Feed Ring.
10. Using a suitable punch, remove the sheared halves of the Shear Pins from the Body.

11. With a socket head wrench, remove the several (usually 5) Set Screws which lock the Knife Pins in place.
12. Remove the Knife Pins by pushing them out with a small brass rod or punch.

CAUTION: These Knife Pins have shoulders, so must be removed from the end of their hole which has the Set Screw holes. They can not be removed from the other end. The knives will fall free when the Knife Pins are removed.

13. Loosen and remove the Guide from the lower end of the Body.
14. With a suitable punch, remove the sheared halves of the Shear Pins from the Feed Ring.

CAUTION: Care should be taken when removing sheared pins from the Body and the Feed Ring, not to distort or otherwise damage the shear pin holes.

After disassembly, all parts should be thoroughly cleaned and each part examined for any sign of advanced wear or damage. The interior of the Body should be free of marks or scratches, bits of shear pin and other loose debris.

The Feed Ring should be free of marks and scratches. Any distortion at edges should be dressed down with a hand file.

All Knives should be in perfect condition for re-use. If they are not, they should be replaced. Very minor wear or damage may sometimes be repaired by skillfully regrinding, but it is important that the proper contour and the overall length of each Knife be maintained without loss.

The Spring Dog Assembly should be checked to assure that all Dog Springs are in place and their rivets tight.

The Ratchet Pawl Assembly when used, should be checked to assure that Pawls, Pawl Pins and Torque Springs are in usable condition, and that the Pawls swing freely on the Pawl Pins.

Reassembly

1. Clamp the Body in a vise near the center of its length.
2. Assemble the Knives in the Body. Set a Knife in position in the Body with the cutting face facing the inside. Slip a Knife Pin through the hole provided in the Body, through the Knife and into the remainder of the pin hole. Insert a Set Screw and tighten. The Knife may be wedged in place by using a strand of soft rope or a piece of hemp string. This will maintain the Knife in position while the remaining Knives are assembled, and during subsequent handling and operation.
3. After all Knives have been assembled, insert the Feed Ring through the top of the Body, with the bevelled face toward the knives. Position the Feed Ring so that the two shear pin holes in the Feed Ring align with the two shear pin holes in the Body.
4. Insert the two Shear Pins into the holes in the Body and in the Feed Ring.

NOTE: The ends of the Shear Pins may be upset slightly with a small hammer to cause them to fit the shear pin holes more snugly.

5. Insert the Main Spring in the Body. Slide it down until it seats against the Feed Ring.
6. Slide the Preload Sleeve into the Body until it seats against the Main Spring.
7. Assemble the Thrust Washer in the Body, followed by the Thrust Bearing.
8. Insert the Spring Dog Assembly in the Body.

CAUTION: Be sure that the Dog Springs in the Spring Dog assembly point toward the upper end of the Body. These must deflect and pass collars going in-hole.

9. Insert the Top Sub in the Body and make it up tight.

NOTE: Since the Main Spring must be partially compressed by the entering Top Sub, considerable resistance will be felt as the Top Sub is made up.

10. Assemble the Guide in the lower end of the Body.

Be sure to use a good quality clean thread dope on the Top Sub and Guide connections.

Bowen Standard External Cutters

Size Pipe to Cut	1.050	1.660	1.315	1.660	1.500	2-1/16	2-3/8	2-3/8	3-1/2 D.P.	4"
	1.315	Tub.	Thru	Thru	Thru	Thru	Thru	Thru	4" D.P.	Thru
	Tub.		2-3/8 Tub.	2-3/8 Tub.	2-7/8 Tub.	3-1/2 Tub.	3-1/2 Tub.	4" Tub.	4-1/2 D.P.	5-3/4 Csg.
									5" D.P.	
Maximum Size Will Pass Over	1.552	2-11/16	3-1/16	3-1/8	3-3/4	4-1/4	4-1/2	4-3/4	6-1/4	6-1/2
Cutter ID	1-5/8	2-3/4	3-1/8	3-1/4	3-7/8	4-3/8	4-5/8	4-7/8	6-3/8	6-5/8
Cutter OD	2-5/16	3-1/2	3-7/8	4-1/2	4-11/16	5-5/8	5-7/8	6-1/16	7-5/8	8-1/8
Minimum Size Hole to Run-In	2-7/16	3-3/4	4-1/8	4-3/4	4-15/16	5-7/8	6-1/8	6-1/4	8-1/4	8-5/8
Complete Assembly	Part No.	32848	150365	47127	47167	47210	47309	47264	47360	47422
	Weight	30	51	51	108	78	181	144	154	293
										281

Replacement Parts

Top Sub	Part No.	13626	150374	47128	47168	47211	33574	47265	33648	33885	33959
	Weight	5	7	7	18	12	28	26	28	55	60
Body	Part No.	13627	150375	47129	47169	47212	47310	47266	47361	47423	47542
	Weight	7	25	25	48	27	90	57	61	115	90
Thrust Washer	Part No.	13633	153069	32904	47171	33083	36484	47268	33650	33887	33961
	Weight	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	3/4	7/8
Thrust Bearing	Part No.	32852	153070	32905	47172	33084	33595	47269	33651	33888	33962
	Weight	1/16	1/8	1/8	1/8	1/8	1/8	1/4	1/4	1/4	3/8
Preload Sleeve	Part No.	32891	150373	45844	47173	47214	33582	47270	47362	47424	47543
	Weight	2	2	2	2-1/2	2-3/4	5-1/2	4	6	9	11
Spring Seat	Part No.	80149	150367	14209	47174	47215	33583	49254	47363	49255	49258
	Weight	1/4	1/4	1/4	1/2	1-1/4	2	3/4	1	1	1
Main Spring	Part No.	13634	150368	14217	33020	33085	9994	39164	33652	33889	33963
	Weight	1	1-1/4	1-1/4	1-1/2	1-1/4	1-1/2	1-1/2	1-1/2	4	3-1/2
Feed Ring	Part No.	13635	150371	32907	47175	33086	33579	47577	33653	33890	33964
	Weight	1/8	1-1/8	1-1/8	2	4	4-1/2	3	4-1/2	7	7
Shear Pin* (2 Req'd.)	Part No.	14205	14205	14205	33891	14205	33891	33891	33891	33891	33891
	Weight	1/32	1/32	1/32	1/16	1/32	1/16	1/16	1/16	1/16	1/16
Knife (5 Req'd.)	Part No.	13637	32909	32909	33023	33088	34553	34553	33655	34553	44802
	Weight	1/8	1/8	1/8	1/8	1/8	1/8	1/4	1/4	3/4	3/4
Knife Pin (5 Req'd.)	Part No.	37015	150372	32910	33024	33089	34554	34554	33656	34554	33966
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/16	1/16
Knife Pin Set Screw (5 Req'd.)	Part No.		32911	32911	23687	23664	8574	8574	23685	23703	23705
	Weight		1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16
Guide	Part No.	13628	150366	14203	47176	33093	33584	39169	33660	33897	33969
	Weight	5	9	9	21	27	30	32	30	69	72
Spring Dog Assembly	Part No.	13629	150376	47131	47177	47216	47313	47271	47365	33949	47545
Consists of:	Weight	3	3-5/8	3-5/8	4-7/8	3-3/4	6	7-3/4	9-1/4	11	24
Spring Dog Body	Part No.	13630	150377	47132	47178	47217	47314	47272	47366	33950	47546
	Weight	1-1/2	2-1/2	2-1/2	3	3-1/4	4-1/4	6	8	9	22
Spring Dog (6 Req'd.)	Part No.	13631	32917	32917	47179	33103	33644	33644	33663	50192	50192
	Weight	1/16	1/8	1/8	1/4	1/8	1/4	1/4	1/4	1/4	1/4
Rivet (12 Req'd.)	Part No.	13632	45626	45626	47180	45842	44803	47180	44803	44803	50191
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32

Optional

Ratchet Pawl Assembly	Part No.	13666	150405	47138	47181	47218	47315	47275	47367	47426	47547
Consists of:	Weight	3	3	3	2-1/4	9-1/4	13	13	15	15	26-3/4
Pawl Body	Part No.	13667	150407	47139	47182	47219	47316	47276	47368	47427	47548
	Weight	2	2-1/4	2-1/4	1-1/2	8-1/2	12	12	13-1/2	13-1/2	24

*See Load Required to Shear Each Shear Pin and Double Shear Strengths on page 13.

Bowen Standard External Cutters

Size Pipe to Cut		1.050	1.660	1.315	1.660	1.500	2-1/16	2-3/8	2-3/8	3-1/2 D.P.	4"
		1.315	Tub.	Thru	Thru	Thru	Thru	Thru	Thru	4" D.P.	Thru
		Tub.		2-3/8 Tub.	2-3/8 Tub.	2-7/8 Tub.	3-1/2 Tub.	3-1/2 Tub.	4" Tub.	4-1/2 D.P.	5-3/4 Csg.
										5" D.P.	
Maximum Size Will Pass Over		1.552	2-11/16	3-1/16	3-1/8	3-3/4	4-1/4	4-1/2	4-3/4	6-1/4	6-1/2
Cutter ID		1-5/8	2-3/4	3-1/8	3-1/4	3-7/8	4-3/8	4-5/8	4-7/8	6-3/8	6-5/8
Cutter OD		2-5/16	3-1/2	3-7/8	4-1/2	4-11/16	5-5/8	5-7/8	6-1/16	7-5/8	8-1/8
Minimum Size Hole to Run In		2-7/16	3-3/4	4-1/8	4-3/4	4-15/16	5-7/8	6-1/8	6-1/4	8-1/4	8-5/8
Complete Assembly	Part No.	32848	150365	47127	47167	47210	47309	47264	47360	47422	47541
	Weight	30	51	51	108	78	181	144	154	293	281

Optional (Continued)

Ratchet Pawl (6 Req'd.)	Part No.	13668	150406	32946	47183	47220	47317	47277	47369	47428	47549
	Weight	5 Req'd	1/16	1/16	1/16	1/16	3/32	3/32	3/32	3/32	3/32
Pawl Spring (6 Req'd.)	Part No.	14213	15656	15656	14829	18729	14829	14829	14829	14829	47443
	Weight	5 Req'd.	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
Pawl Pin (6 Req'd.)	Part No.	37011	33128	33128	37019	33128	37031	47253	39174	37031	47550
	Weight	5 Req'd.	1/32	1/32	1/32	1/32	1/8	1/8	1/8	1/8	1/8
Single Pawl Spacer *	Part No.	32890	150468	47141	47190	47227	47326	47286	47378	47437	47557
	Weight	2	3	4	7	8-1/2	14-1/2	7-1/2	22	35	60
Slip Assembly **	Part No.	—	—	47133	47185	47221	47319	47279	47371	47430	47551
	Weight	—	—	9-1/8	11-1/8	12	19	21-1/4	31-3/4	46-3/4	73
Slip	Part No.	—	—	47134	47186	47222	47320	47280	47372	47431	47552
	Weight	—	—	3-1/2	1-1/8	4-1/4	5-1/2	6	13	17	19
Slip Bowl	Part No.	—	—	47135	47187	47223	47321	47281	47373	47432	47553
	Weight	—	—	1	1-1/8	1	1	1-1/4	1-3/4	4-1/4	6-1/2
Slip Bowl Retainer	Part No.	—	—	47136	47188	47224	47322	47282	47374	47433	47554
	Weight	—	—	4-1/4	8-1/2	6-1/4	12	13-1/2	16-1/2	25	47
Slip Spring	Part No.	—	—	47137	47189	47225	47323	47283	47375	47434	47556
	Weight	—	—	1/8	1/8	1/4	1/4	1/4	1/4	1/4	1/4
Slip Bowl Shear Pin (4 Req'd.)	Part No.	—	—	47208	47208	47208	47324	47324	47324	47435	47555
	Weight	—	—	1/16	1/16	1/16	1/16	1/16	1/16	1/8	1/8
Slip Adaptor	Part No.	—	—	47130	47170	47213	47311	47267	47364	47425	47544
	Weight	—	—	12	11	14	15	17	18	19	20
Load Required to Shear Each Shear Pin - lbs		377	377	377	805	377	805	805	805	805	805
Double Shear Strength - lbs		754	754	754	1,610	754	1,610	1,610	1,610	1,610	1,610
Load Required to Shear Each Slip Bowl Shear Pin - lbs				4,125	4,125	4,125	8,285	8,285	8,285	8,285	8,285
Quadruple Shear Strength - lbs				16,500	16,500	16,500	33,150	33,150	33,150	33,150	33,150

* Used with Ratchet Pawl Assembly.

** See Load Required to Shear Each Slip Bowl Shear Pin and Quadruple Shear Strengths at the bottom of this table.

How to Order

Specify:

- (1) Name and number of assembly or part
- (2) Size, weight and type of washpipe top connection
- (3) Any desired optionals by name and number
- (4) Any desired spares by name and number

RECOMMENDED SPARES

- (1) 2 Spring Dog, Ratchet Pawl, or Slip Assemblies
- (2) 1 Feed Ring
- (3) 24 Shear Pins
- (4) 6 Sets Knives
- (5) 2 Sets Knife Pins
- (6) 1 Set Knife Pin Screws

Maximum Length and Load of Tubing or Drill Pipe to be Picked Up

External Cutter Knives				Ratchet Paws			
Tubing or Drill Pipe Size (inches)	Cutter No.	Length (ft)	Load (lbs)	Length (ft)	Load (lbs)	OD	ID
1.050 Tbg.	32848	1,650	1,985	1,700	2,000	2-5/16	1-5/8
1.315 Tbg.	32848	1,500	2,800	2,000	3,600		
1.315 Tbg.	47127	666	1,200	888	1,600	3-7/8	3-1/8
1.660 Tbg.	47127	583	1,400	875	2,100		
1.900 Tbg.	47127	552	1,600	965	2,800		
2-1/16 Tbg.	47127	500	1,700	1,029	3,500		
2-3/8 Tbg.	47127	468	2,200	1,400	6,600		
1.660 Tbg.	47167	2,420	5,800	3,630	8,740	4-12	3-1/4
1.900 Tbg.	47167	2,275	6,600	3,430	9,940		
2-1/16 Tbg.	47167	2,088	7,100	3,150	10,725		
2-3/8 Tbg.	47167	1,830	8,600	2,804	12,900		
1.900 Tbg.	47210	379	1,100	420	1,225	4-11/16	3-7/8
2-1/16 Tbg.	47210	347	1,180	375	1,275		
2-3/8 Tbg.	47210	276	1,300	275	1,290		
2-7/8 Tbg.	47210	260	1,700	300	1,930		
2-7/8 Tbg.	47309	1,307	8,500	1,965	12,750	5-5/8	4-3/8
3-1/2 Tbg.	47309	1,258	11,700	1,905	17,700		
2-3/8 Tbg.	47309	1,210	5,700	2,020	9,500		
2-1/16 Tbg.	47309	1,290	4,400	2,350	8,000		
2-1/16 Tbg.	47264	1,545	5,250	2,320	7,875	5-7/8	4-5/8
2-3/8 Tbg.	47264	1,212	5,700	1,850	8,735		
2-7/8 Tbg.	47264	1,061	6,900	1,610	10,500		
3-1/2 Tbg.	47264	1,000	9,300	1,515	14,100		
2-3/8 Tbg.	47360	500	2,350	750	3,525	6-1/16	4-3/4
2-7/8 Tbg.	47360	415	2,700	625	4,070		
3-1/2 Tbg.	47360	387	3,600	570	4,555		
4 Tbg.	47360	436	4,800	655	7,200		
3-1/2 D.P.	47422	315	4,790	470	7,180	7-5/8	6-1/4
4 D.P.	47422	325	5,100	500	7,750		
4-1/2 D.P.	47422	295	5,900	450	8,925		
5 D.P.	47422	395	7,700	600	11,625		
3-1/2 D.P.	47541	350	5,400	525	8,100	8-1/8	6-1/2
4 D.P.	47541	380	5,950	570	8,925		
4-1/2 O.D.	47541	335	6,700	500	10,125		
5 D.P.	47541	446	8,700	745	13,090		
5-1/2 D.P.	47541	412	10,400	640	15,640		
5-3/4 Csg.	47541	550	12,400	830	18,640		

NOTE: These are maximum static loads. If shock loaded, reduce values 50%.

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* Denotes Manufacturing and Engineering facilities

Downhole Solutions

Drilling Solutions

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Lifting and Handling Solutions

Production Solutions

Supply Chain Solutions

Tubular and Corrosion Control Solutions

Well Service and Completion Solutions